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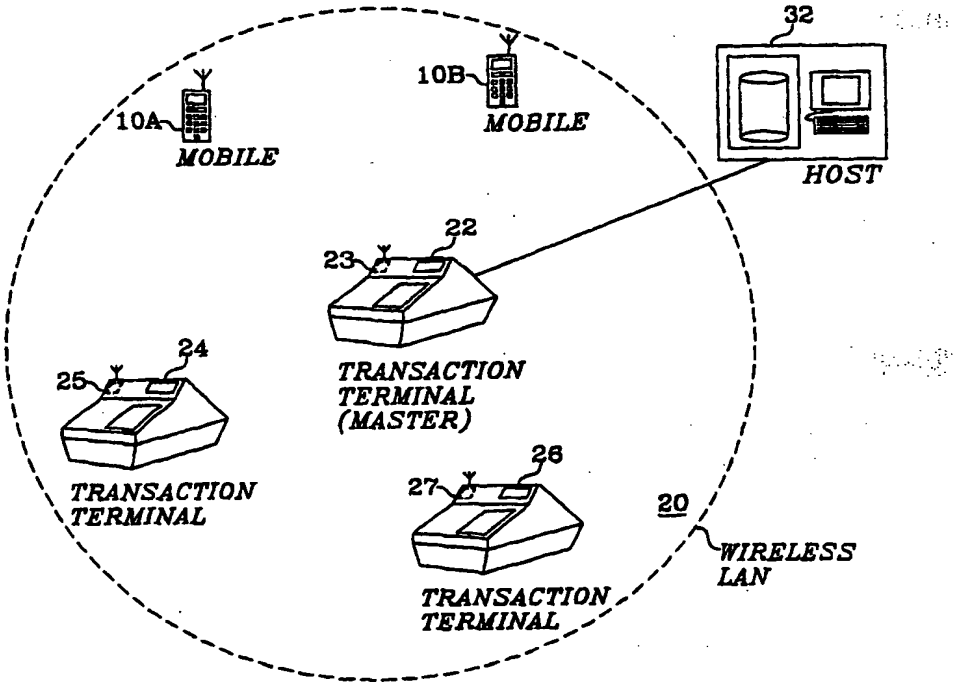
(57) Abstract

The invention relates to a transaction system and method involving a mobile terminal having service-card transaction functions. The transaction system comprises a wireless LAN having at least one transaction terminal, and at least one mobile terminal. The mobile terminal preferably comprises means for implementing at least one virtual service card, and the service-card transaction functions include functions for handling virtual service cards. The mobile terminal is connectable to the wireless LAN to enable a service card transaction, related to the virtual service card, between the mobile and a transaction terminal via the wireless LAN.



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SERVICE CARD TRANSACTIONS OVER A WIRELESS LAN

TECHNICAL FIELD OF THE INVENTION

The present invention relates to a mobile terminal having service-card transaction functions, and a transaction system and method involving such a mobile terminal.

BACKGROUND OF THE INVENTION

The need to use service cards, such as credit cards, cash cards and company-identity cards, in place at shops, stores, company locations and public utilities is well known. Today, this need is satisfied through various plastic cards interworking with card readers in a known manner. The card is normally inserted into a card slot in the card reader, and subsequently the card reader reads information from the card. For certain types of smart cards, information can also be transferred to the card. Modern card readers for credit cards normally have a keypad for entering a PIN-code (Personal Identification Number Code) and accepting the transaction. Cash cards do not normally require a PIN-code; only an acceptance or a rejection of the transaction. The card reader may also have functions to handle cash register sums from an electronic cash register and functions for on-line control of credit card numbers.

Although the use of credit cards and other types of service cards has become very popular, conventional card and card reader systems has certain drawbacks which provide a barrier to more widespread use and prevent new applications.

For example, conventional card readers are a limiting factor for using smart cards. In an effort to alleviate this problem to some extent, so-called

contactless smart cards have been introduced. Contactless smart cards use a radio contact of very short distance (typically up to 40 centimeters), and a connection is established between the card reader and the smart card by energizing the card through a radio signal from the card reader.

Another limiting factor is the amount of plastic cards to be handled. It is not unusual for an individual to have a dozen different plastic cards, and this is of course quite inconvenient.

In addition, with ordinary plastic cards it is sometimes necessary to hand over the card to for example a waiter at a restaurant in order to pay. In that case, the cardholder is not in control of the card during payment.

RELATED ART

Motorola, Siemens and Alcatel offer a dual-slot mobile phone by which it is possible to insert a cash-card into an extra card slot in the phone. The mobile phone is provided with a card reader for cash cards, and by using the conventional radio interface of the mobile phone it is envisaged that a connection may established with a special server in a bank for loading the cash-card.

The international patent application WO 97/45814 discloses a wireless terminal used for remote purchase and bill payment transactions as well as transfer of telecash to other terminals without using the GSM network. More specifically, the terminal is a mobile phone, which can also operate as an electronic wallet. By using the terminal the user is able to send/receive payment messages and electronic cash directly to/from another terminal under a small *adjustable terminal-to-terminal radio coverage*. The terminal-to-terminal radio coverage is adjusted such that only the payer and the payee will be able to exchange information and telecash, without using the network.

Microsoft Corporation offers an electronic wallet software in which information, such as card number and expiry date, associated with a plastic card can be stored in a personal computer and used for the purpose of Internet commerce.

U.S. Patent 5,796,832 discloses a financial information and transaction system in which a portable terminal is connected to a financial institution via a wireless or cellular telephone hook-up. Smart cards are utilized to verify authorization for transactions to minimize potential security problems, which could otherwise result from the use of a mobile terminal. The system according to U.S. Patent 5,796,832 seems to be adapted for transactions over longer distances, in similarity to electronic commerce over the Internet.

SUMMARY OF THE INVENTION

The present invention overcomes these and other drawbacks of the prior art arrangements.

It is a general object of the present invention to provide an improved transaction system and method.

In particular, it is important that the transaction system is more flexible than conventional systems, and capable of handling various different transaction conditions in an efficient manner.

It is another object of the invention to provide a mobile terminal, which is convenient to use for local service card transactions.

These and other objects are met by the invention as defined by the accompanying patent claims.

The general idea according to the present invention is to use a wireless local area network, a so-called wireless LAN, and one or more mobile terminals that

are connectable to the wireless LAN, as a platform for service card transactions.

The transaction system according to a preferred embodiment of the invention comprises at least one wireless LAN having at least one transaction terminal, and at least one mobile terminal. The mobile terminal comprises service-card transaction functions, and means for implementing at least one virtual service card such as a credit card or a cash card. Preferably, the service-card transaction functions are implemented as a general platform, for example in the form of an electronic wallet, which is capable of handling virtual service cards. Furthermore, the mobile terminal is connectable to the wireless LAN to enable a service card transaction between the mobile terminal and a transaction terminal via the wireless LAN. Together with the electronic wallet, the virtual service cards in the mobile terminal can be used for local service card transactions over the wireless LAN.

In this way, an efficient and flexible transaction system is obtained.

By using a wireless LAN, relatively long distances between a transaction terminal and a mobile terminal can be handled. The system is also capable of handling a transaction environment in which many transactions are performed more or less in parallel between several parties, irrespective of the distance between the parties. In addition, the transaction system according to the invention is independent of the operators of larger public networks such as the GSM network, as well as blocking and fault conditions in such networks.

By implementing the service cards as virtual service cards in a mobile terminal the need for plastic cards is reduced, and maybe eliminated in the longer term. The electronic wallet of the mobile terminal may act as a platform for a number of virtual service cards.

In addition, the capabilities of mobile terminals such as mobile phones and personal digital assistants (PDAs) open up for new applications, such as reading and storing information in connection with the service card transactions. For example, receipts and other information associated with a service card transaction may be stored in the mobile terminal, possibly for later transfer to a personal computer.

According to a preferred embodiment of the invention, a number of parameter values identifying a session to be completed by a service card transaction are transmitted by the mobile terminal to the transaction terminal. For example, the session may be a purchase or an order of goods or services. When the session has been identified, the transaction terminal normally transmits information about the session, e.g. in the form of a bill, to the mobile terminal such that the service card transaction can be accepted or rejected based on this information. When the service card transaction has been accepted by the user of the mobile terminal, the transaction terminal commits the transaction.

An alternative embodiment of the invention involves a mobile terminal that includes a card reader provided with a card slot for insertion of a real service card. In the case of a mobile phone, which already has a card place for a conventional SIM card, an additional card slot for the service card is provided in the mobile phone. The mobile terminal further comprises means for connecting the mobile terminal to the wireless LAN to enable a service card transaction, related to the service card, between the mobile terminal and a transaction terminal via the wireless LAN. In a restaurant for example, instead of leaving the plastic card to a waiter, which takes the card and goes away to perform the service card transaction using an ordinary card reader, the user just inserts the service card into the mobile terminal, and the service card transaction is then performed over the wireless LAN.

Although the service card transactions performed over the wireless LAN preferably are financial transactions such as credit card and cash card

transactions, it should be understood that other types of transactions are feasible as well; for example transactions made when borrowing books at a library or when recording and giving discounts to users or clients, or even transactions between an electronic key and an electronic door lock.

In the same way, it should be understood that the term service card not only relates to credit cards and cash cards, but also to other types of cards such as discount cards, bonus cards, membership cards, identity cards, company-identity cards, electronic key cards and combined cards including a combination of such cards.

The invention offers the following advantages:

- A flexible transaction system and method;
- The need for ordinary plastic cards is reduced;
- Local transactions over relatively long distances are allowed;
- Several parallel transactions are easily handled;
- Public network independency;
- No need to hand over the service card to outside individuals; and
- Possibility to read and store information, such as receipts, associated with the service card transactions.

Other advantages offered by the present invention will be appreciated upon reading of the below description of the embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention, together with further objects and advantages thereof, will be best understood by reference to the following description taken together with the accompanying drawings, in which:

Fig. 1 is a schematic diagram of a mobile terminal according to a preferred embodiment of the invention;

Fig. 2 is a diagram of a layered representation of the service card functionality and its environment in the mobile terminal of Fig. 1;

Fig. 3 is a schematic diagram illustrating a first example of a transaction system according to a preferred embodiment of the invention;

Fig. 4 is a schematic diagram illustrating a second example of a transaction system according to a preferred embodiment of the invention;

Fig. 5 is a schematic diagram of screen displays in a mobile terminal, illustrating a procedure for identifying a session according to a preferred embodiment of the invention;

Fig. 6 is a schematic flow diagram of a transaction method according to a preferred embodiment of the invention;

Fig. 7 is a schematic diagram illustrating a third example of a transaction system according to a preferred embodiment of the invention;

Fig. 8 is a diagram illustrating a first example of a communication session performed in a system such as that illustrated in Fig. 7;

Fig. 9 is a diagram illustrating a second example of a communication session performed in a system such as that illustrated in Fig. 7;

Fig. 10 is a schematic diagram illustrating a fourth example of a transaction system according to a preferred embodiment of the invention;

Fig. 11 is a diagram illustrating a third example of a communication session performed in a system such as that illustrated in Fig. 10; and

Fig. 12 is a schematic diagram of a transaction system according to an alternative embodiment of the invention;

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

Throughout the drawings, the same reference characters will be used for corresponding or similar elements.

In order to avoid misconceptions, the following definitions are made:

A virtual service card is a set of data, or a set of software-implemented operations and associated data, issued by a card issuer and used by a cardholder for the purpose of service card transactions. When using the card, the cardholder has to observe the policies and rules that may be requested by the card issuer. For example, a cash-card, which traditionally is represented on a smart card, will include software as well as data when implemented as a virtual card, whereas a simple virtual service card will include only data.

A service card transaction is an activity or a series of activities related to a service card and involving at least two parties. In general, the activity is carried on to conclusion, and results in information being transferred from/to the service card. An example of a service card transaction is an operation on a credit card such as reading data or changing data, eventually resulting in funds being transferred from one account to another account. Other examples of service card transactions are reading information from a key card, and checking the authority of a cardholder. A transaction may of course be composed of a sequence of smaller transactions, but in the following the concept of a session is introduced for a sequence of transactions and/or other events. The purpose is to reduce ambiguity and increase clarity.

A session is a sequence of events and/or transactions performed for a certain purpose. Throughout the disclosure, a session is normally associated with a service card transaction. In that case, the service card transaction constitutes

a part of the session, and typically the session is completed by the service card transaction. An example of a session is the purchase of goods in a shop, which at least involves registering of the selected items and paying with a credit card or cash card. Another example of a session is the opening of an electronic lock with an electronic key, which at least involves reading key information, checking the authority of the key holder and maybe registering the event.

According to the present invention, a wireless local area network (wireless LAN) and one or more mobile terminals connectable to the wireless LAN are used as a platform for service card transactions.

Fig. 1 is a schematic diagram of a mobile terminal according to a preferred embodiment of the invention. Preferably, the mobile terminal is based on a mobile telephone or a personal digital assistant (PDA). The mobile terminal 10 is by way of example illustrated as a mobile telephone. As a mobile telephone, the terminal 10 has a conventional memory (not shown), a display 2, a key pad 4, a radio interface and antenna 5, a processing environment 6 such as a microprocessor, and a conventional microphone and speaker system (not shown).

Furthermore, service-card transaction functions are implemented in the mobile terminal, for example as software in the processing environment 6. The service-card transaction functions are preferably implemented as a general platform, a so-called electronic wallet, in the mobile terminal. In addition, a number of virtual service cards are implemented in the processing environment 6. The virtual service cards are used together with the electronic wallet platform for service card transactions over the wireless LAN, and the platform preferably provides functionality that can be used by several virtual service cards.

A virtual service card is generally a set of data or a combination of software functions and associated data that can replace the functionality of its plastic

card counterpart. Card information, such as card number, expiry date, cardholder and card issuer, associated with each one of the virtual cards is stored in mobile terminal 10.

Fig. 2 is a diagram of a layered representation of the service card functionality and its environment in the mobile terminal of Fig. 1. The bottom layer includes the mobile terminal 10 with its processing capabilities, memory devices, power equipment, user interfaces and a wireless LAN interface. Preferably, a Java Virtual Machine (JVM) 12 is implemented in the mobile terminal. Java is an example of a programming language that can be used to implement the electronic wallet platform 14 and a number of virtual service cards (1, 2, 3, 4) 16. Java is an object-oriented language, and as such it involves the encapsulation of software functions and data into objects, and is therefore suitable for preventing interference between the software and/or data of different virtual cards. Normally, the electronic wallet 14 provides general service-card transaction functions, whereas each one of the virtual service cards 16 may include card specific data and/or software. The general service-card transaction functions of the electronic wallet platform include activation of selected virtual service cards, and reading and possibly writing relevant card information from and to the virtual service cards.

In a more general sense, the electronic wallet may be viewed as the electronic counterpart of a real wallet, including the general transaction functions as well as the virtual service cards.

In use, the electronic wallet in the mobile terminal 10 is normally accessed by entering a PIN-code. Next, the electronic wallet 14 with its transaction functions and virtual service cards is operated, for example by using the display 2 and the keypad 4.

Different cards may have different requirements on security support and input/output capabilities. The mobile terminal to be used must fulfill all

requirements for the card, or otherwise the card will not be installed. Since different mobile terminals may have different hardware and software functions, the virtual card in itself is normally configured to handle different types of terminals. During installation of a virtual card, the card normally finds out which kind of mobile terminal that is used, and then stores information about the capabilities of the terminal.

Examples of virtual service cards are credit cards, cash cards, discount cards, bonus cards, membership cards, identity cards and electronic key cards. Furthermore, two or more cards can be combined into a combination card such as a combination of a credit card and a bonus card.

It is advantageous to show, at command, a visual representation 3 of one or more virtual service cards on the display 2. In general, each virtual service card has its own characteristic appearance on the display 2 so as to facilitate the selection of service card. It is also possible to use a characteristic acoustic signal for each virtual card.

The mobile terminal 10 also comprises a wireless LAN interface 8, which enables connection to a wireless LAN. Any wireless LAN interface known to the art, such as a conventional infrared LAN interface or a radio LAN interface, can be used by the invention. Preferably, however, a radio LAN chip based on Bluetooth technology is provided in the mobile terminal 10. The Bluetooth technology will be described in more detail later on.

In addition, the mobile terminal 10 may have a protecting circuit 7, also referred to as a protected circuit, for encapsulation, protection and/or encryption of sensitive information such as private keys, PIN-codes and possibly biometric codes such as electronic fingerprints. Preferably, the protecting circuit 7 is a physically encapsulated integrated circuit that includes a non-erasable memory such as a read only memory (ROM) in which data and/or software are stored.

Fig. 3 is a schematic diagram illustrating a first example of a transaction system according to a preferred embodiment of the invention. The transaction system basically comprises a number of mobile terminals 10A, 10B, and a wireless LAN 20 that includes a number of transaction terminals 22, 24, 26.

Each one of the transaction terminals 22, 24, 26 in the wireless LAN 20 has service-card transaction functions and circuitry 23, 25 and 27, respectively for enabling communication with other terminals within the LAN 20.

Each one of the mobile terminals 10A, 10B is identical to the mobile terminal described in connection with Figs. 1 and 2. Consequently, each mobile terminal is provided with circuitry for implementing service-card transaction functions and for implementing one or more virtual service cards. The mobile terminal is also provided with circuitry for connecting the mobile terminal to the wireless LAN 20 so as to enable a service card transaction, related to a virtual service card, between the mobile terminal and a transaction terminal via the wireless LAN 20.

In Fig. 3, the transaction terminals 22, 24, 26 as well as the mobile terminals 10A, 10B are connected to and constitute part of the wireless LAN 20, as indicated by the dotted circle. The transaction system according to the invention is particularly useful for local service card transactions, financial and other service card transactions, at place in for example shops, stores, companies and public utilities.

In general, a wireless LAN is a local area network which does not utilize physical wires or cables as transmission medium. The two types of media normally used for wireless LANs are radio waves and infrared optical signals. Radio LANs are direction insensitive and generally have a greater range of coverage than infrared LANs.

According to a preferred embodiment of the invention, the wireless LAN is a radio LAN based on Bluetooth, which is a local radio interface developed by the Bluetooth Special Interest Group promoted by Ericsson, Nokia, IBM, Toshiba and Intel.

However, it should be understood that Bluetooth is merely an example of a wireless LAN technology that can be used by the invention. Other examples of wireless LANs include radio LANs such as HyperLAN, and even infrared LANs. In fact, any wireless LAN that fulfils the following requirements may be used by the invention: The terminals should be able to establish a connection, which may carry protocols involved in a session. This connection should be established either autonomously when entering the coverage area of a wireless LAN, or on demand when the terminal is within that area. The delay until the connection has been successfully established should be short, at most a few seconds. Further, it is advantageous if no configuration in advance for a certain terminal or user is required.

In the following, the invention will mainly be described with reference to Bluetooth as base technology for the wireless LAN. Bluetooth is a radio interface in the 2.45 GHz frequency band that enables terminals to connect and communicate wirelessly via short-range local area networks (wireless LANs). Bluetooth is particularly suitable for, but not limited to, so-called ad hoc networks.

In Bluetooth, each unit can simultaneously communicate with several other units. Bluetooth uses a frequency-hop spread spectrum technique dividing the frequency band into several hop channels. During a connection, the radio transceivers in the LAN hop from one channel to another in a pseudo-random way. Bluetooth channels use a frequency-hop/time-division-duplex (FH/TDD) scheme, and each channel is divided into 625 μs intervals, so-called slots, where a different hop frequency is used for each slot.

In Bluetooth, two or more units sharing the same channel form a so-called piconet (a LAN), in which one unit acts as a master, controlling the traffic in the piconet, and the other units act as slaves. Each piconet has a unique set of master parameters that are used in creating a unique channel. In each slot, a packet can be exchanged between the master and one of the slaves. Packets have a fixed format in Bluetooth, and each packet begins with a 72-bit access code that is derived from the master identity, and unique for the channel. The access code is used for packet identification, synchronization and offset compensation in the wireless LAN. A header trails the access code, and a payload of up to 2,745 bits may trail the header.

Bluetooth units that are within range of each other can establish so-called ad hoc connections. Unlike ordinary cellular systems, there is no a priori distinction between terminals and base stations in Bluetooth. As mentioned above, two or more Bluetooth units that share a channel form a piconet. To regulate traffic on the channel, one of the participating units becomes a master of the piconet. Any unit can become a master, but by definition, the unit that establishes the piconet assumes this role. All other participants are slaves. Participants may change roles if a slave wants to take over the master role. However, only one master at a time may exist in a piconet. When units are not participating in a piconet, they enter standby mode, from which they periodically listen for page messages.

Furthermore, Bluetooth allows several piconets to be created with overlapping coverages. Each piconet then adheres to its own hopping sequence.

More detailed information on Bluetooth can be found, e.g. in the article *Bluetooth – The universal radio interface for ad hoc, wireless connectivity* by J. Haartsen, Ericsson Review, No. 3, 1998, pages 110-117.

It should be understood that the Bluetooth technology is an example of a base technology used to enable local communication between terminals, and that

the service card transactions and the associated exchange of information are performed on top of this underlying technology.

By using a wireless LAN, especially a radio LAN such as Bluetooth, for local service card transactions, relatively long distances between transaction terminals and mobile terminals can be handled. The system is also capable of handling several transactions performed more or less in parallel between several parties, and irrespective of the distance between the parties, as long as the transactions are performed over the wireless LAN.

With reference once again to Fig. 3, each one of the transaction terminals 22, 24, 26 in the wireless LAN 20 is preferably provided with a wireless LAN chip based on Bluetooth technology. Normally, one of the transaction terminals acts as master station of the wireless LAN 20. The master station 22 is often connected in a known manner via the public network and/or hard wire to a host server 32. In a conventional manner, the host server 32 may provide additional functionality not included in the transaction terminals themselves.

If the transaction terminals are used in connection with ordinary cash registers, the transaction terminals may have functions to handle cash register sums from a cash register. Furthermore, the transaction terminals may have functions for on-line control of credit card numbers, and functions to transfer information about the transactions to servers or host computers 32 of a bank or credit card company.

In addition to the transaction functions used for the virtual service cards, the transaction terminals may also include conventional card readers, such as ordinary card readers and card readers for contactless cards so as to be capable of handling virtual service cards as well as ordinary plastic cards. In that case, the conventional card readers and the functionality used for the virtual service cards preferably share the same cash register functions and have common functions for communication with host servers.

It is of course also possible to utilize the security arrangements used for conventional cards and card readers in connection with service card transactions performed between terminals over a wireless LAN as well. For example, if authentication by an identity card such as a driver's license and a real signature on a receipt is required for a certain plastic card, this procedure may also be used for the virtual counterpart of the plastic card. However, full advantage of the virtual card concept according to the invention is obtained when authentication and confirmation are performed over the wireless LAN by using the electronic wallet and its capabilities. In general, mutual authentication and confirmation may be required. The SET (Secure Electronic Transaction) protocol, for example, is capable of handling mutual authentication and confirmation.

Although the transaction system of Fig. 3 is illustrated as having two mobile terminals, and three transaction terminals, it should be understood that only one mobile terminal and one transaction terminal are required in the wireless LAN to perform a service card transaction. The transaction terminals are not necessarily fixed terminals, but may be mobile.

In addition to credit cards and cash cards, which are well known, a few other types of service cards that may be implemented as virtual service cards in a mobile terminal according to the invention will be discussed briefly below.

A library card is a sort of identity card by which a user can be identified as a registered user at a library. Information about a number of borrowed books together with a last day for return may be transferred from a transaction terminal at the library to the mobile terminal, and the user may then accept the loan. The virtual library card may have a World Wide Web (WWW) link to the home page of the library where information on e.g. opening and closing hours, late return fees, etc. can be found.

An electronic key card is a virtual card that replaces a conventional key or a conventional plastic key card for a door. A transaction terminal provided in connection to the door lock controls if the user of the virtual key card in the mobile terminal is authorized for access through the door.

A membership card is a service card that confirms membership in an association or club. For example, it is possible to use the virtual membership card as a combined membership and discount card if membership in the association in question entitles to discounts in certain shops and stores. If the association has a clubhouse, the virtual card could also be used as a virtual electronic key.

A company-identity card can be used as a virtual electronic key and as a means for identification in general. In addition, the virtual card may be used for payments e.g. in a company restaurant. The company may have agreements with shops, stores and gyms, and the card can then be used to get discounts.

In Sweden, the pharmacy card is a sort of bonus card, on which a purchase at a pharmacy will be registered and a discount given in accordance with predetermined rules.

Preferably, the service card transactions over the wireless LAN are financial transactions such as credit card and cash card transactions. In the following, an example of how to perform a financial service card transaction between two parties or terminals in a wireless LAN will be described with reference to Figs. 4 and 5.

Fig. 4 is a schematic diagram illustrating a second example of a transaction system according to a preferred embodiment of the invention. The transaction system comprises a number of at least partially overlapping wireless LANs. In the example of Fig. 4, three wireless LANs A, B and C are illustrated, each of

which has a transaction terminal 22, 24 and 26, respectively. The transaction system further comprises two mobile terminals 10A, 10B that are within the coverage of at least one of the LANs. The mobile terminal 10B is within the coverage of two of the LANs A and B.

Assume by way of example that a transaction is to be performed between a mobile terminal 10B operated by a user and a transaction terminal of a wireless LAN operated by a salesman or merchant. In a connectivity layer of the wireless LAN, a connection between the mobile terminal and the transaction terminal is established. If the transaction terminal involved acts as master station of the wireless LAN, the mobile terminal and the transaction terminal communicate directly with each other. However, if the transaction terminal involved in the transaction is not a master station, communication between transaction terminal and mobile terminal is normally, although not necessarily, performed via the master station of the wireless LAN.

For financial transactions over the wireless LAN, a procedure is normally required to identify the session to be completed by the payment transaction and to ensure that payment is performed with the relevant transaction parties involved. The relevant transaction parties and the relevant session are identified by a number of parameter values transferred over the wireless LAN. The number of parameter values necessary for this identification varies from case to case. Normally, the transaction terminal of the salesman knows which parameters are required to identify a session among a number of on-going sessions in the local network. The transaction terminal preferably transmits information about which parameters that are requested, or information on selectable parameter values for each one of the parameters to the mobile terminal, and the mobile terminal then responds by transmitting the parameter values.

If there is only one salesman and one transaction terminal, the session is identified in a quite straightforward manner. The same applies if there are

several transaction terminals, but only one active session to be completed by a transaction.

However, if there are several transaction terminals with many active sessions, or if there are many different wireless LANs operated by different salesmen, the situation becomes more complex. With reference to Fig. 4, imagine a market-hall or shopping center with a number of different shops, stands and restaurants, where each shop/stand may have several cash register terminals. Each shop, stand and restaurant may have its own wireless LAN (a piconet), and the wireless LANs in the market-hall may overlap each other, at least partially. When a customer has made a purchase in a shop and wants to pay by using the electronic wallet of the mobile terminal according to the invention, the wireless LAN of the shop in question has to be found, and then the correct cash register terminal in the shop must be addressed in order to completely identify the session.

Fig. 5 is a schematic diagram of screen displays in a mobile terminal, illustrating a procedure for identifying a session according to a preferred embodiment of the invention. If the mobile terminal receives signals from the wireless LANs of several salesmen, shops or restaurants, the options may be presented on the display 42 of the mobile terminal. The user of the mobile terminal preferably uses the key pad to select one of the wireless LANs, for example the LAN of shop or restaurant 'B', and a parameter value representative of the selected wireless LAN is transmitted to the LAN in question. Next, if there are several alternative cash register terminals, i.e. transaction terminals, these alternative terminals may also be presented as for example menu options on the display 44 of the mobile terminal. The user of the mobile terminal selects one of the terminals and a corresponding parameter value is transmitted to the selected transaction terminal.

Alternatively, for example in a restaurant, the transaction terminals transmit information about which parameters that are requested in order to identify a

session. This information may be presented on the display 46 of the mobile terminal, and the user then enters a number of parameter values that are subsequently transmitted over the wireless LAN. The session may be identified by using the number of the table in the restaurant, and if necessary even the seat at the table. Normally, the parameter value or values also identify the transaction terminal. The parameter value for the table may indirectly point out a particular transaction terminal assigned to this table.

In other words, depending on the local conditions, a number of selections of parameter values have to be made in order to identify the transaction parties and the relevant session.

The electronic wallet according to the invention may also include support for ordering of goods and services. In a restaurant for example, a menu can be transferred from a transaction terminal in the restaurant to the mobile terminal of a user. Preferably, the menu is then displayed in the mobile terminal and the food can be ordered by using the order functions of the electronic wallet. The order may be presented at a terminal for the waiter who subsequently transfers the order to the kitchen. Alternatively, the order is presented at a terminal in the kitchen. A session number is assigned to the order, and stored in the transaction terminal as well as the mobile terminal. At payment, the session number can be retrieved and used to identify the transaction.

Preferably, the order is stored in the cash register included in or connected to a transaction terminal of the restaurant. The bill can then be produced on request and transferred to the electronic wallet of the user's mobile terminal without any interference of the waiter.

If the restaurant has a system for ordering, it can be used by employees of the restaurant. If a guest does not have a mobile terminal equipped with an electronic wallet according to the invention, a waiter can use such a mobile

terminal to take the order and transfer it by using the electronic wallet therein. The bill is then easily produced, based on the electronic order. For additional flexibility and convenience, the terminal used by the waiter may also include functions to print out the bill and an ordinary card reader for plastic cards.

When the relevant transaction parties and the relevant session has been identified, the relevant transaction terminal normally transmits a bill to the buyer so that the he or she can check that the bill corresponds to the products/services bought. When the transaction has been accepted, the buyer selects the credit card or cash card that he or she wants to use to complete the session. By using menu options or icons, a card is selected from the electronic wallet in the mobile terminal 10B. The electronic wallet platform in the mobile terminal operates, in some sense, as a card reader and reads the relevant information, such as card number, card holder, card issuer and expiry date, from the selected virtual card. This information is transmitted to the transaction terminal by the LAN interface of the mobile terminal utilizing the security system that is associated with the currently used card. The transaction terminal receives the service card information and commits, in response to an acceptance of the transaction, the payment transaction. By commit is meant that the transaction is carried on to a conclusion, seen form the perspective of the user of the mobile terminal. If appropriate, the transaction terminal transfers information to a server or host computer of a bank or credit card company, where the transaction is registered and funds eventually are transferred from the account of the user to the account of the salesman.

It is important that the card intended to be used, is indeed selected and used for the payment. Therefore, it is advantageous to give visual displays of the virtual cards and/or characteristic acoustic signals, as mentioned above in connection with Fig. 1.

Fig. 6 is a schematic flow diagram of a transaction method according to a preferred embodiment the invention. The transaction method according to the invention involves a mobile terminal, which has service-card transaction functions. In step 52, at least one virtual service card is implemented in the mobile terminal, and the service-card transaction functions include functions for handling the virtual service card. In step 54, the mobile terminal is connected to a wireless LAN which includes at least one transaction terminal, and in step 56 a service card transaction related to the virtual service card is performed between the mobile terminal and the transaction terminal via the wireless LAN.

Fig. 7 is a schematic diagram illustrating a third example of a transaction system according to a preferred embodiment of the invention. The wireless LAN 60 of the transaction system comprises two mobile terminals 10A, 10B and a single transaction terminal 22. Assume by way of example that the mobile terminal 10A is requesting the initiation of a transaction.

Fig. 8 is a diagram illustrating a first example of a communication session performed in a system such as that illustrated in Fig. 7. First, the mobile terminal 10A transmits a request 70 to the transaction terminal 22 over the wireless LAN 60. If there is only one relevant on-going session, the transaction terminal 22 transmits information 72 about a session to be completed by a service card transaction, in response to the request 70. The session information 72 may include detailed information about the session; for example in the form of a bill with a specification of a purchase. Alternatively, the session information may simply be a cash register sum. Based on the session information, the user accepts or rejects the service card transaction, and the mobile terminal 10A then transmits an acceptance or rejection 74 of the transaction, normally together with service card information 74 to the transaction terminal. The service card information normally includes a service card number and associated information. In response to an acceptance of the transaction, the transaction terminal 22 commits 76 the transaction. If

necessary, the transaction terminal 22 also transfers information to a server in a bank or other institution.

Fig. 9 is a diagram illustrating a second example of a communication session performed in a system such as that illustrated in Fig. 7. First, the mobile terminal 10A transmits a request 80 to the transaction terminal 22 over the wireless LAN 60. In response to the request 80, the transaction terminal 22 transmits information 82 on which parameter(s) that is requested to identify a session among a number of on-going sessions, or selectable parameter values for each one of the parameter(s). To identify a session, the user of the mobile terminal enters at least one parameter value 84 that is transmitted to the transaction terminal over the wireless LAN. Next, information 86 about the identified session is transmitted to the mobile terminal over the wireless LAN 60. Based on this information, the user may accept or reject a service card transaction. If OK, the mobile terminal transmits an acceptance 88 to the transaction terminal 22. The mobile terminal 10A also transmits service card information 88, such as a service card number or equivalent, to the transaction terminal 22. In response to an acceptance and the service card information, the transaction terminal 22 commits 90 the transaction.

Fig. 10 is a schematic diagram illustrating a fourth example of a transaction system according to a preferred embodiment of the invention. The wireless LAN 100 of the transaction system comprises three transaction terminals 22, 24, 26, and three mobile terminals 10A, 10B, 10C.

Fig. 11 is a diagram illustrating a third example of a communication session performed in a system such as that illustrated in Fig. 10. The mobile terminal 10A transmits a request 120 and at least one parameter value 124 that identifies a session associated a service card transaction over said wireless LAN. Preferably, the parameter value or values 124 are sent to the master station 22 of the LAN 100. The parameter value or values 124 also identifies one of the transaction terminals of the LAN, and the master station 22 informs

the identified transaction terminal. The identified transaction terminal transmits information 126 about the identified session to the mobile terminal over the wireless LAN. The mobile terminal receives the session information to enable acceptance/rejection of the service card transaction based on this information, and an acceptance or a rejection 128 of the transaction is transmitted to the identified transaction terminal. The mobile terminal also transmits service card information 128 to the identified transaction terminal over the wireless LAN, and finally the transaction terminal commits 130 the transaction in response to an acceptance.

Fig. 12 is a schematic diagram of a transaction system according to an alternative embodiment of the invention. The transaction system 200 of Fig. 12 is similar to the system of Fig. 3, except for the mobile terminals 11A, 11B. Each one of the mobile terminals 11A, 11B includes a card reader for a real service card. Any ordinary card reader, such as a card reader provided with a card slot for insertion of a real plastic card or a contactless card reader, may be used by the invention. Preferably, the mobile terminals 11A, 11B are based on conventional dual-slot mobile phones, but it is possible to use other mobile terminals such as a PDA provided with a card reader. In the same way as for the mobile terminals 10 described above, each one of the mobile terminals 11A, 11B further comprises means for connecting the mobile terminal to the wireless LAN 200 to enable a service card transaction, related to the real service card, between the mobile terminal and a transaction terminal via the wireless LAN. In use, the card reader reads information from the service card. A software module executing in the processing environment of the mobile terminal handles the information and makes sure that the information is ready to be transmitted over the wireless LAN by a wireless LAN interface such as a Bluetooth chip. For smart cards, the card reader may write information to the card.

Of course, it is possible to combine a card reader for real service cards and a "card reader" for virtual service cards in a mobile terminal according to the

invention. In that case, the electronic wallet software that handles the virtual service cards may also handle the information read from the real plastic service cards by the ordinary card reader.

According to a further alternative embodiment of the invention, based on the information read by the card reader from the real plastic service card, a virtual counterpart, i.e. a corresponding virtual service card, is generated by use of the electronic wallet software.

More on security aspects

The electronic wallet platform according to the invention may support several different security levels. Different service cards may have different requirements on the security system. The lowest security level is merely based on the ownership of the mobile terminal. However, this is normally not the recommended level of security.

Sensitive information such as card number, the identity of the cardholder and the card issuer and expiry date can be encrypted with the private key of the card issuer. This makes sure that this information can not be manipulated, but gives no protection for unauthorized duplication of the card.

Storing a transaction number or a session number for each transaction facilitates a later review of performed transactions if transaction errors are suspected. By using a procedure in which transaction numbers are selected by the transaction terminal in a random way, and in which the mobile terminal stores the most recent transaction number to be sent over to the transaction terminal at a new transaction, certain types of fraudulent behavior may be detected. For example, it is possible to detect a duplicated card used in parallel with the ordinary card.

The use of biometric procedures may provide a higher security level than the use of PIN-codes. Examples of such biometric procedures include scanning of

fingerprints, voice recognition mechanisms, and the use of digital signatures. These biometric methods may replace the PIN-code or used as a complement.

Storing and checking PIN-codes and/or biometric codes in special hardware may provide a higher level of security than that obtained when storing the PIN-code in a conventional computer memory. The special hardware can either be provided at the SIM card of the mobile terminal, if such a card exists, or provided at an additional smart card. It is also possible to use a built-in hardware function for this purpose. The hardware should have functions for limiting the number of unsuccessful attempts to access the card or the electronic wallet.

A security function commonly required by many service cards is encryption by a private key to prove authentication. By implementing the encryption/protecting circuit in protected hardware, and storing the key in the same hardware, it is possible to securely hide the key. Normally, a certificate is issued by a so-called Certification Authority. The certificate binds a person to a predetermined public key. More information on certificates, private keys and public keys can be found e.g. in the book *Understanding Digital Signatures* by G. L. Grant, McGraw-Hill, New York, 1998, pages 123-126.

Standardized protocols for different types of transactions do exist and new protocols are being developed. An example is the SET-protocol (Secure Electronic Transaction). SET is primarily intended for credit card transactions over the Internet. The main security goals of SET are information confidentiality, payment information integrity and merchant/cardholder authentication. With SET it is possible to protect e.g. the cardholder's credit card number, and make sure that only authorized parties can use it. More information on SET can be found e.g. in the book *Understanding Digital Signatures* by G. L. Grant, McGraw-Hill, New York, 1998, pages 110-116. According to an embodiment of the invention, such a protocol is implemented in the transaction system according to the invention.

It should be understood that public wireless telecommunication networks, such as the GSM network using the WAP protocol (Wireless Application Protocol), may be used by the mobile phones according to the invention for service card transactions over longer distances in a traditional manner.

The embodiments described above are merely given as examples, and it should be understood that the present invention is not limited thereto. Further modifications, changes and improvements which retain the basic underlying principles disclosed and claimed herein are within the scope and spirit of the invention.

CLAIMS

1. A transaction system comprising at least one mobile terminal (10) having service-card transaction functions,
characterized in that said system further comprises at least one wireless LAN (20; 60; 100; A,B,C) having at least one transaction terminal (22,24,26); and
said mobile terminal further comprises:
- means (6,12) for implementing at least one virtual service card (16), said service-card transaction functions including functions for handling said virtual service card;
- means (8) for connecting said mobile terminal to said wireless LAN to enable a service card transaction associated with said virtual service card (16) between said mobile terminal and said transaction terminal via said wireless LAN.

2. The system according to claim 1,
characterized in that said mobile terminal comprises means for transmitting at least one parameter value identifying a session associated with said transaction to said transaction terminal over said wireless LAN.

3. The system according to claim 2,
characterized in that said wireless LAN comprises means for transmitting information on which parameter(s) that is requested, and/or information on selectable parameter values for each one of said parameter(s) to said mobile terminal.

4. The system according to claim 2,
characterized in that said wireless LAN comprises a plurality of transaction terminals, and said parameter value or values identifies one of said transaction terminals.

5. The system according to claim 2,
characterized in that said mobile terminal comprises means for transmitting an order of a product or service to said transaction terminal, a session number being assigned to said order in said mobile terminal as well as in said transaction terminal and used as said at least one parameter value to identify said order session.

6. The system according to claim 1,
characterized in that said means (6,12) for implementing at least one virtual service card (16) includes means for generating a visual representation (3) of said service card or cards in said mobile terminal.

7. The system according to claim 1,
characterized in that said virtual service card is selected from the group of: a credit card, a cash card, a discount card, a bonus card, a membership card, an identity card, a company-identity card, an electronic key card and a combination card including a combination of such cards.

8. The system according to claim 1,
characterized in that said service-card transaction functions are credit card or cash card transaction functions, and said virtual service card is a virtual credit card or a virtual cash card.

9. The system according to claim 1,
characterized in that said virtual service card includes service card specific software and data.

10. The system according to claim 1,
characterized in that said mobile terminal further comprises means for transmitting a request to said transaction terminal over said wireless LAN;

said transaction terminal comprises means for transmitting, in response to said request, information about a session associated with said transaction to said mobile terminal over said wireless LAN;

said mobile terminal further comprises means for receiving said session information to enable acceptance/rejection of said transaction based on said session information, and for transmitting an acceptance or a rejection of said transaction to said transaction terminal over said wireless LAN;

said mobile terminal further comprises means for transmitting service card information to said transaction terminal over said wireless LAN; and

said transaction terminal comprises means for committing said transaction in response to said service card information and to an acceptance of said transaction.

11. The system according to claim 1,

characterized in that said mobile terminal further comprises means for transmitting a request to said transaction terminal over said wireless LAN;

said mobile terminal further comprises means for transmitting at least one parameter value identifying a session associated with said transaction to said transaction terminal over said wireless LAN;

said transaction terminal comprises means for transmitting, in response to said session identifying parameter value, information about said session to said mobile terminal over said wireless LAN;

said mobile terminal further comprises means for receiving said session information to enable acceptance/rejection of said transaction based on said session information, and for transmitting an acceptance or a rejection of said transaction to said transaction terminal over said wireless LAN;

said mobile terminal further comprises means for transmitting service card information to said transaction terminal over said wireless LAN; and

said transaction terminal comprises means for committing said transaction in response to said service card information and an acceptance of said transaction.

12. The system according to claim 1,
characterized in that said wireless LAN (20; 100) comprises a plurality of transaction terminals;

said mobile terminal further comprises means for transmitting a transaction request and at least one parameter value identifying a session associated with said transaction over said wireless LAN, wherein said parameter value or values at the same time identifies one of said transaction terminals;

said identified transaction terminal comprises means for transmitting information about said session to said mobile terminal over said wireless LAN;

said mobile terminal further comprises means for receiving said session information to enable acceptance/rejection of said transaction based on said session information, and for transmitting an acceptance or a rejection of said transaction to said identified transaction terminal over said wireless LAN;

said mobile terminal further comprises means for transmitting service card information to said identified transaction terminal over said wireless LAN; and

said identified transaction terminal comprises means for committing said transaction in response to said service card information and to an acceptance of said transaction.

13. The system according to claim 1,
characterized in that said wireless LAN (20; 100) comprises a plurality of transaction terminals and a master station (22);

said mobile terminal further comprises means for transmitting a transaction request and at least one parameter value identifying a session associated with said transaction to said master station (22) over said wireless LAN, wherein said parameter value or values at the same time identifies one of said transaction terminals and said master station informs the identified transaction terminal;

said identified transaction terminal comprises means for transmitting information about said session to said mobile terminal over said wireless LAN;

said mobile terminal further comprises means for receiving said session information to enable acceptance/rejection of said transaction based on said session information, and for transmitting an acceptance or a rejection of said transaction to said identified transaction terminal over said wireless LAN;

said mobile terminal further comprises means for transmitting service card information to said identified transaction terminal over said wireless LAN; and

said identified transaction terminal comprises means for committing said transaction in response to said service card information and to an acceptance of said transaction.

14. The system according to claim 1,
characterized in that said transaction system comprises a plurality of overlapping wireless LANs (A,B,C); and

said mobile terminal further comprises means for transmitting at least one parameter value identifying a session associated with said transaction over said wireless LANs, wherein said parameter value or values at the same time identifies one of said overlapping wireless LANs such that further communication is performed within the identified wireless LAN.

15. The system according to claim 1,
characterized in that said mobile terminal is based on a mobile telephone or a personal digital assistant (PDA).

16. A mobile terminal having service-card transaction functions,
characterized in that said mobile terminal (10) further comprises:

- means (6,12) for implementing at least one virtual service card (16), said service-card transaction functions including functions for handling said virtual service card;
- means (8) for connecting said mobile terminal to a wireless LAN (20; 60; 100; A,B,C) including at least one transaction terminal (22,24,26) to

perform a service card transaction related to said virtual service card between said mobile terminal and said transaction terminal via said wireless LAN.

17. The mobile terminal according to claim 16,
characterized in that said mobile terminal further comprises means for transmitting at least one parameter value identifying a session associated with said transaction to said transaction terminal over said wireless LAN.

18. The mobile terminal according to claim 16,
characterized in that said means (6,12) for implementing at least one virtual service card (16) includes means for generating a visual representation (3) of said service card or cards in said mobile terminal.

19. The mobile terminal according to claim 16,
characterized in that said virtual service card is selected from the group of: a credit card, a cash card, a discount card, a bonus card, a membership card, an identity card, a company-identity card, an electronic key card and a combination card including a combination of such cards.

20. The mobile terminal according to claim 16,
characterized in that said service-card transaction functions are credit card or cash card transaction functions, and said virtual service card is a credit card or a cash card.

21. The mobile terminal according to claim 16,
characterized in that said virtual service card includes service card specific software and data.

22. The mobile terminal according to claim 16,
characterized in that it further comprises a protecting circuit, with encryption capabilities, implemented in hardware, and that an encryption key is stored within said hardware to securely hide said encryption key.

23. The mobile terminal according to claim 16,
characterized in that said mobile terminal is based on a mobile telephone or a personal digital assistant (PDA).

24. A transaction method involving a mobile terminal having service-card transaction functions,
characterized in that said method comprises the steps of:

- implementing (52) at least one virtual service card in said mobile terminal (10), said service-card transaction functions including functions for handling said virtual service card;
- connecting (54) said mobile terminal to at least one wireless LAN (20; 60; 100; A,B,C) comprising at least one transaction terminal (22,24,26);
- performing (56) a service card transaction related to said virtual service card between said mobile terminal and said transaction terminal via said wireless LAN.

25. The method according to claim 24,
characterized in that said method further comprises the step (84, 124) of said mobile terminal transmitting at least one parameter value identifying a session associated with said transaction to said transaction terminal over said wireless LAN.

26. The method according to claim 25,
characterized in that said method further comprises the step (82, 122) of transmitting information on which parameter(s) that is requested, and/or information on selectable parameter value(s) for each one of said parameter(s) to said mobile terminal.

27. The method according to claim 25,
characterized in that said wireless LAN comprises a plurality of transaction terminals, and said parameter value identifies one of said transaction terminals.

28. The method according to claim 25,
characterized in that said method further comprises the step of said mobile terminal transmitting an order of a product or service to said transaction terminal;

assigning a session number to said order in said mobile terminal as well as in said transaction terminal, said session number being used as said at least one parameter value to identify said order session.

29. The method according to claim 24,
characterized in that said method further comprises the steps of:

said mobile terminal transmitting a request (70; 80; 120) to said transaction terminal over said wireless LAN;

said transaction terminal transmitting, in response to said request, information (72; 86; 126) about a session associated with said transaction to said mobile terminal over said wireless LAN;

said mobile terminal receiving said session information to enable acceptance/rejection of said transaction based on said session information, and transmitting an acceptance or rejection (74; 88; 128) of said transaction to said transaction terminal over said wireless LAN;

said mobile terminal transmitting service card information (74; 88; 128) to said transaction terminal over said wireless LAN; and

said transaction terminal committing (76; 90; 130) said transaction in response to said service card information and an acceptance of said transaction.

30. The method according to claim 24,
characterized in that said method further comprises the steps of:

said mobile terminal transmitting a request (80; 120) to said transaction terminal over said wireless LAN;

said mobile terminal transmitting at least one parameter value (84; 124) identifying a session associated with said transaction to said transaction terminal over said wireless LAN;

said transaction terminal transmitting, in response to said session identifying parameter value, information (86; 126) about said session to said mobile terminal over said wireless LAN;

said mobile terminal receiving said session information to enable acceptance/rejection of said transaction based on said session information, and transmitting an acceptance or a rejection (88; 128) of said transaction to said transaction terminal over said wireless LAN;

said mobile terminal transmitting service card information (88; 128) to said transaction terminal over said wireless LAN; and

said transaction terminal committing (90; 130) said transaction in response to said service card information and an acceptance of said transaction.

31. The method according to claim 24, wherein said wireless LAN (20; 100) comprises a plurality of transaction terminals (22, 24, 26),
characterized in that said method further comprises the steps of:

said mobile terminal transmitting a transaction request (120) and at least one parameter value (124) identifying a session associated with said transaction over said wireless LAN, wherein said parameter value or values (124) at the same time identifies one of said transaction terminals;

said identified transaction terminal transmitting information (126) about said session to said mobile terminal over said wireless LAN;

said mobile terminal receiving said session information to enable acceptance/rejection of said transaction based on said session information, and transmitting an acceptance or a rejection (128) of said transaction to said identified transaction terminal over said wireless LAN;

said mobile terminal transmitting service card information (128) to said identified transaction terminal over said wireless LAN; and

said identified transaction terminal committing (130) said transaction in response to said service card information and to an acceptance of said transaction.

32. The method according to claim 24, wherein said wireless LAN (20; 100) comprises a plurality of transaction terminals and a master station (22), characterized in that said method further comprises the steps of:

said mobile terminal transmitting a transaction request (120) and at least one parameter value (124) identifying a session associated with said transaction to said master station (22) over said wireless LAN, wherein said parameter value or values (124) at the same time identifies one of said transaction terminals, and said master station (22) informs the identified transaction terminal;

said identified transaction terminal transmitting information (126) about said session to said mobile terminal over said wireless LAN;

said mobile terminal receiving said session information to enable acceptance/rejection of said transaction based on said session information, and transmitting an acceptance or a rejection (128) of said transaction to said identified transaction terminal over said wireless LAN;

said mobile terminal transmitting service card information (128) to said identified transaction terminal over said wireless LAN; and

said identified transaction terminal committing (130) said transaction in response to said service card information and to an acceptance of said transaction.

33. The method according claim 24,
characterized in that said method further comprises the steps of:

said mobile terminal transmitting at least one parameter value identifying a session associated with said transaction over a plurality of overlapping wireless LANs (A,B,C), wherein said parameter value or values at the same time identifies one of said overlapping wireless LANs such that further communication is performed within the identified wireless LAN.

34. A transaction system comprising at least one mobile terminal having a card reader for a real service card,

characterized in that said system further comprises at least one wireless LAN having at least one transaction terminal; and

said mobile terminal further comprises means for connecting said mobile terminal to said wireless LAN to enable a service card transaction, related to said service card, between said mobile terminal and said transaction terminal via said wireless LAN.

35. The transaction system according to claim 34,
characterized in that said mobile terminal further comprises means for implementing a virtual service card to enable a service card transaction related to said virtual service card over said wireless LAN.

36. The transaction system according to claim 34,
characterized in that said mobile terminal further comprises means generating a virtual service card based on information read by said card reader from said real service card.

37. The transaction system according to claim 34, wherein said mobile terminal is a dual-slot mobile telephone.

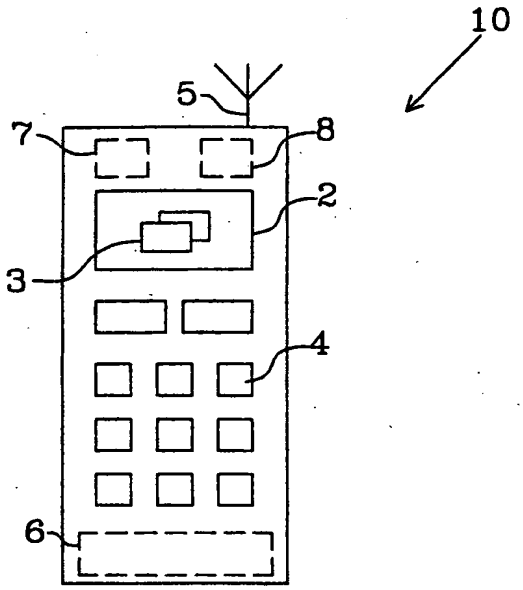

Fig. 1

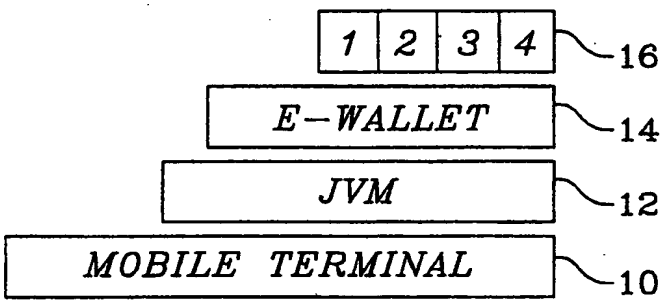

Fig. 2

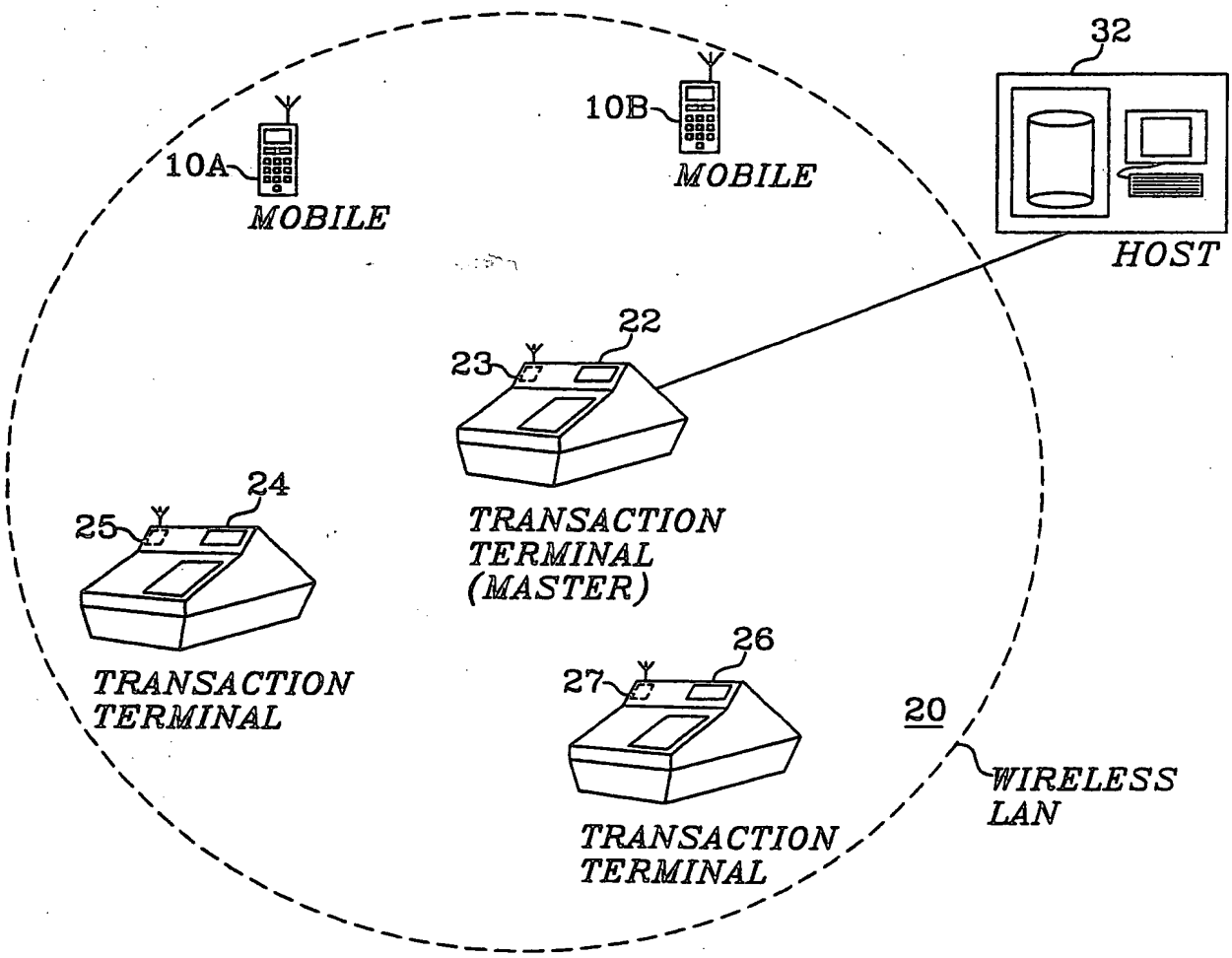
32
10B
MOBILE
10A
MOBILE
HOST
22
23
TRANSACTION
TERMINAL
(MASTER)
24
25
TRANSACTION
TERMINAL
26
27
TRANSACTION
TERMINAL
20
WIRELESS
LAN

Fig. 3

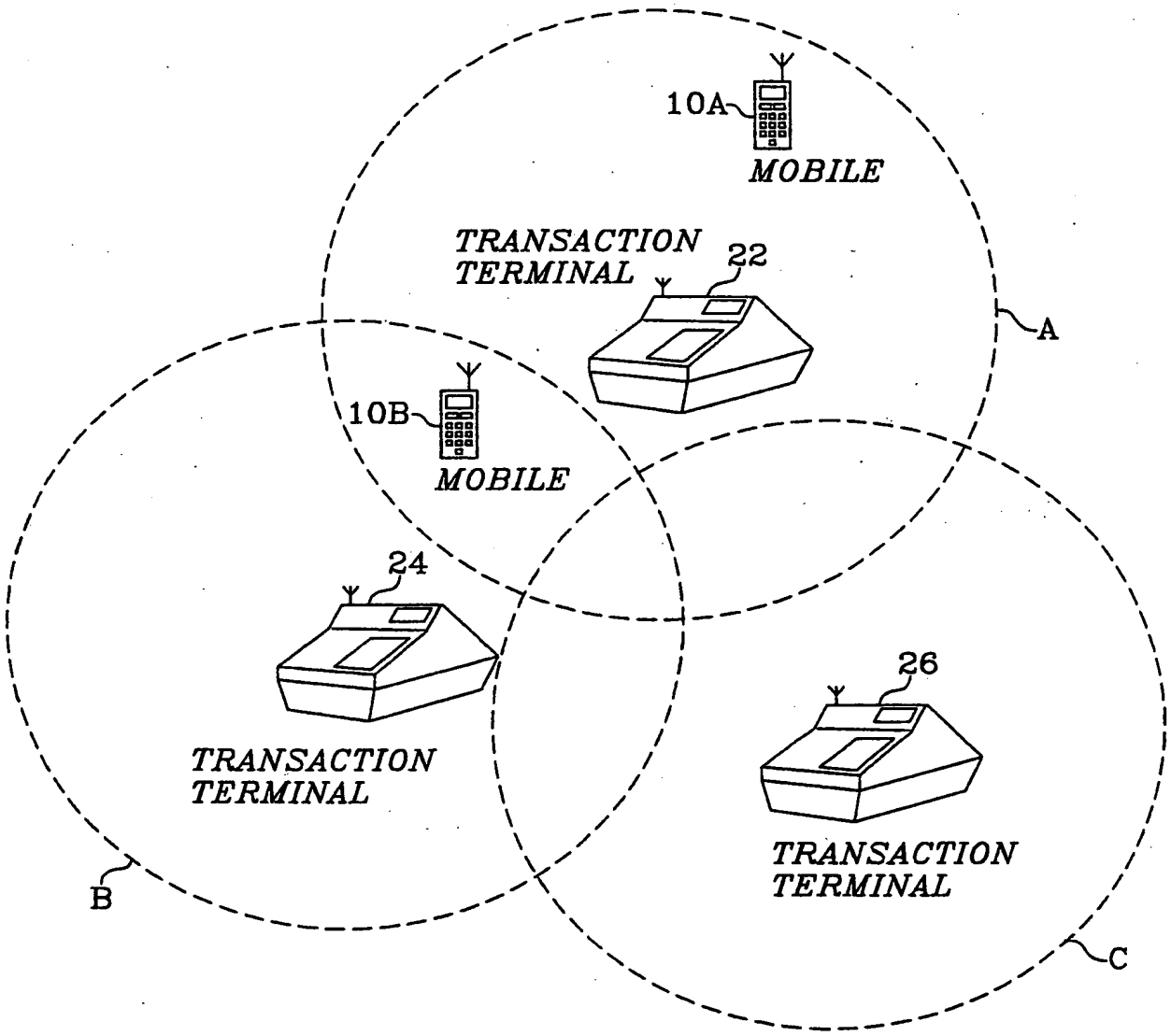
10A
MOBILE
TRANSACTION TERMINAL
22
A
10B
MOBILE
24
TRANSACTION TERMINAL
26
TRANSACTION TERMINAL
B
C

Fig. 4

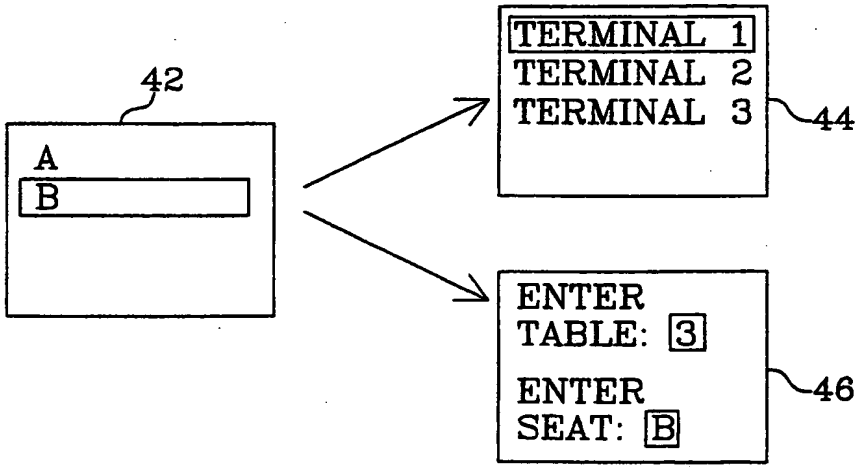
42
A
B
TERMINAL 1
TERMINAL 2
TERMINAL 3
44
ENTER TABLE: 3
ENTER SEAT: B
46

Fig. 5

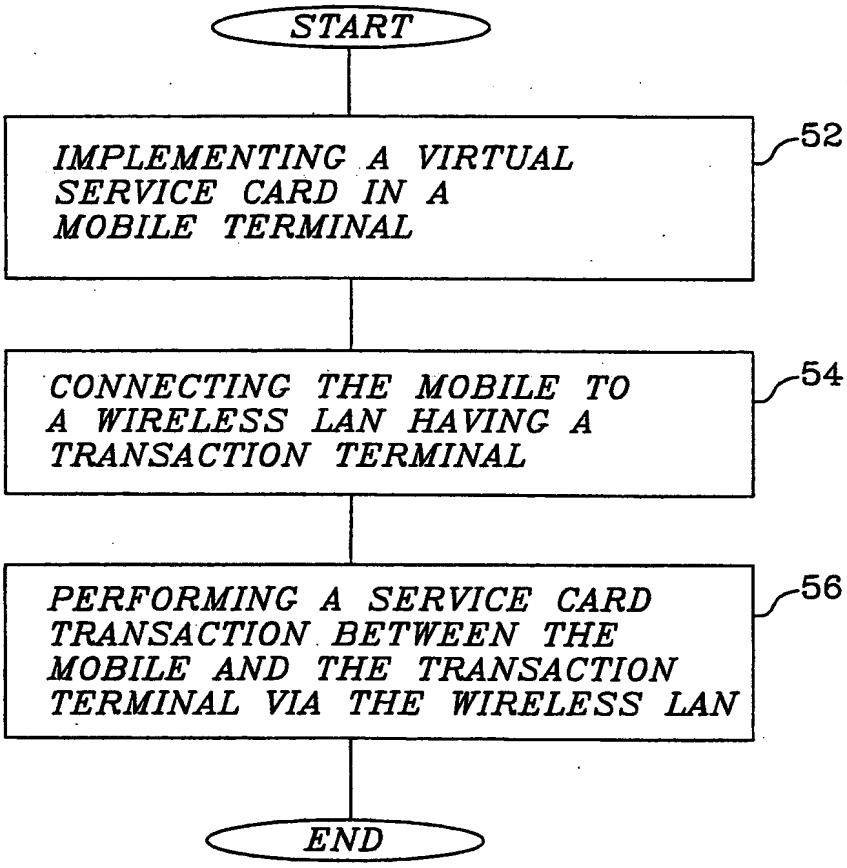
START
IMPLEMENTING A VIRTUAL SERVICE CARD IN A MOBILE TERMINAL
52
CONNECTING THE MOBILE TO A WIRELESS LAN HAVING A TRANSACTION TERMINAL
54
PERFORMING A SERVICE CARD TRANSACTION BETWEEN THE MOBILE AND THE TRANSACTION TERMINAL VIA THE WIRELESS LAN
56
END

Fig. 6

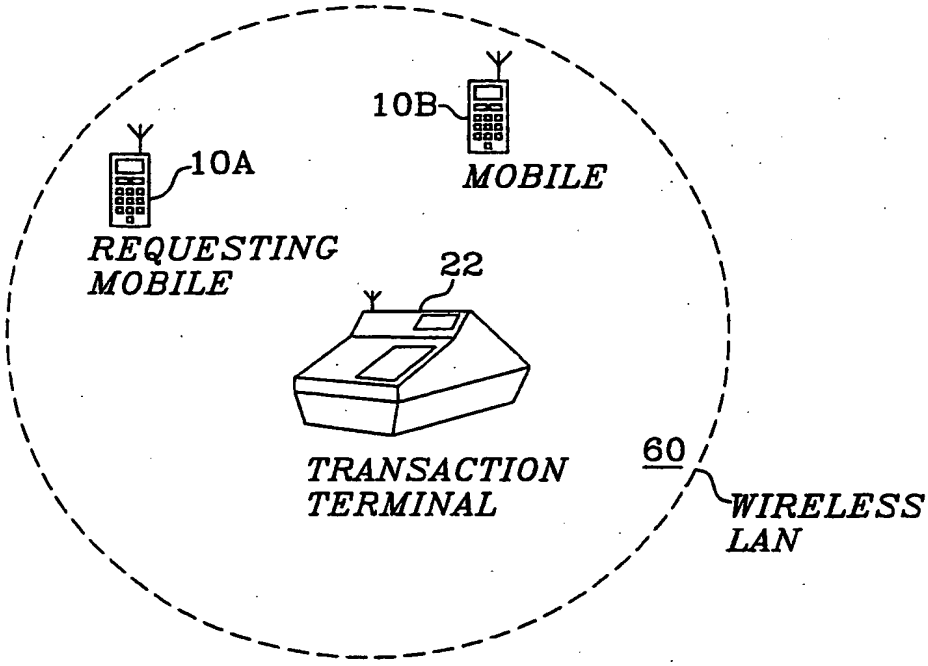

Fig. 7

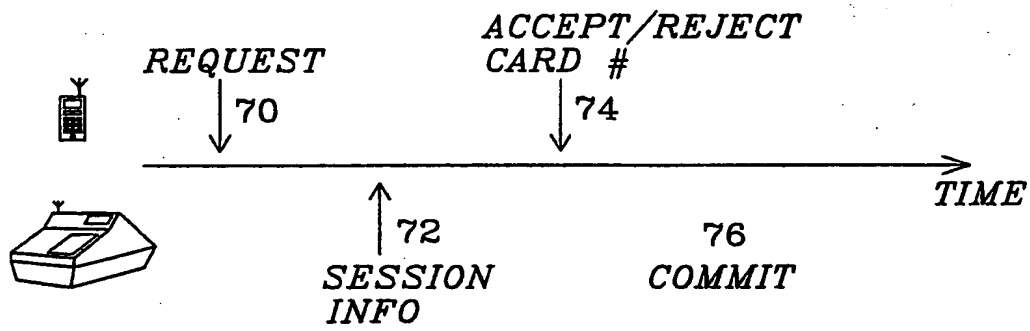

Fig. 8

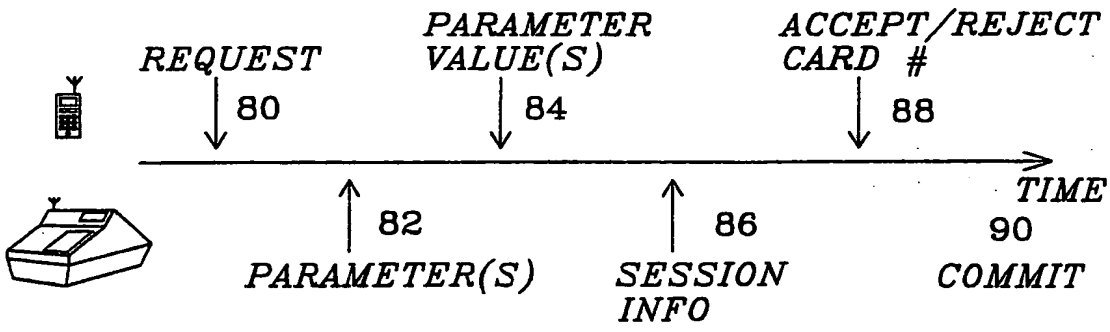

Fig. 9

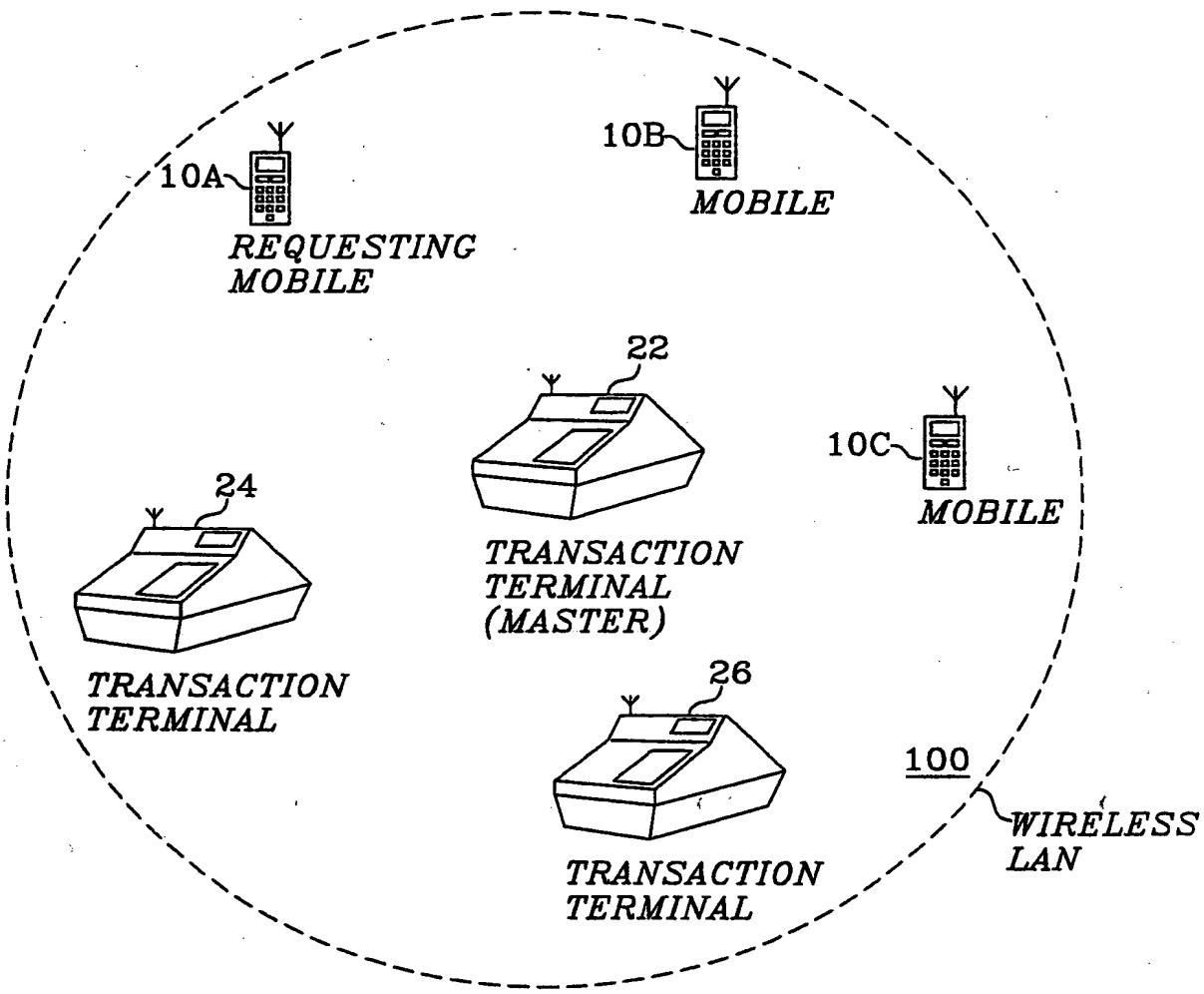
10A
REQUESTING MOBILE
10B
MOBILE
22
TRANSACTION TERMINAL (MASTER)
10C
MOBILE
24
TRANSACTION TERMINAL
26
TRANSACTION TERMINAL
100
WIRELESS LAN

Fig. 10

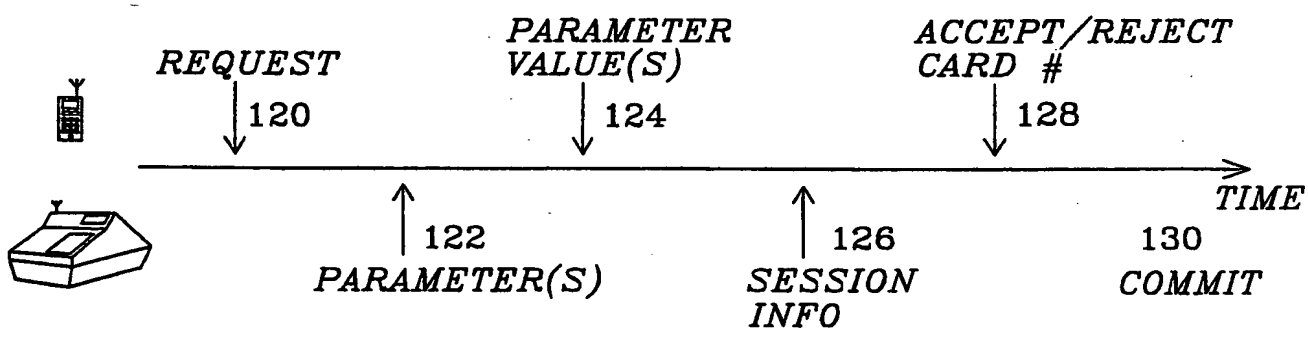
REQUEST
120
PARAMETER VALUE(S)
124
ACCEPT/REJECT CARD #
128
TIME
122
PARAMETER(S)
126
SESSION INFO
130
COMMIT

Fig. 11

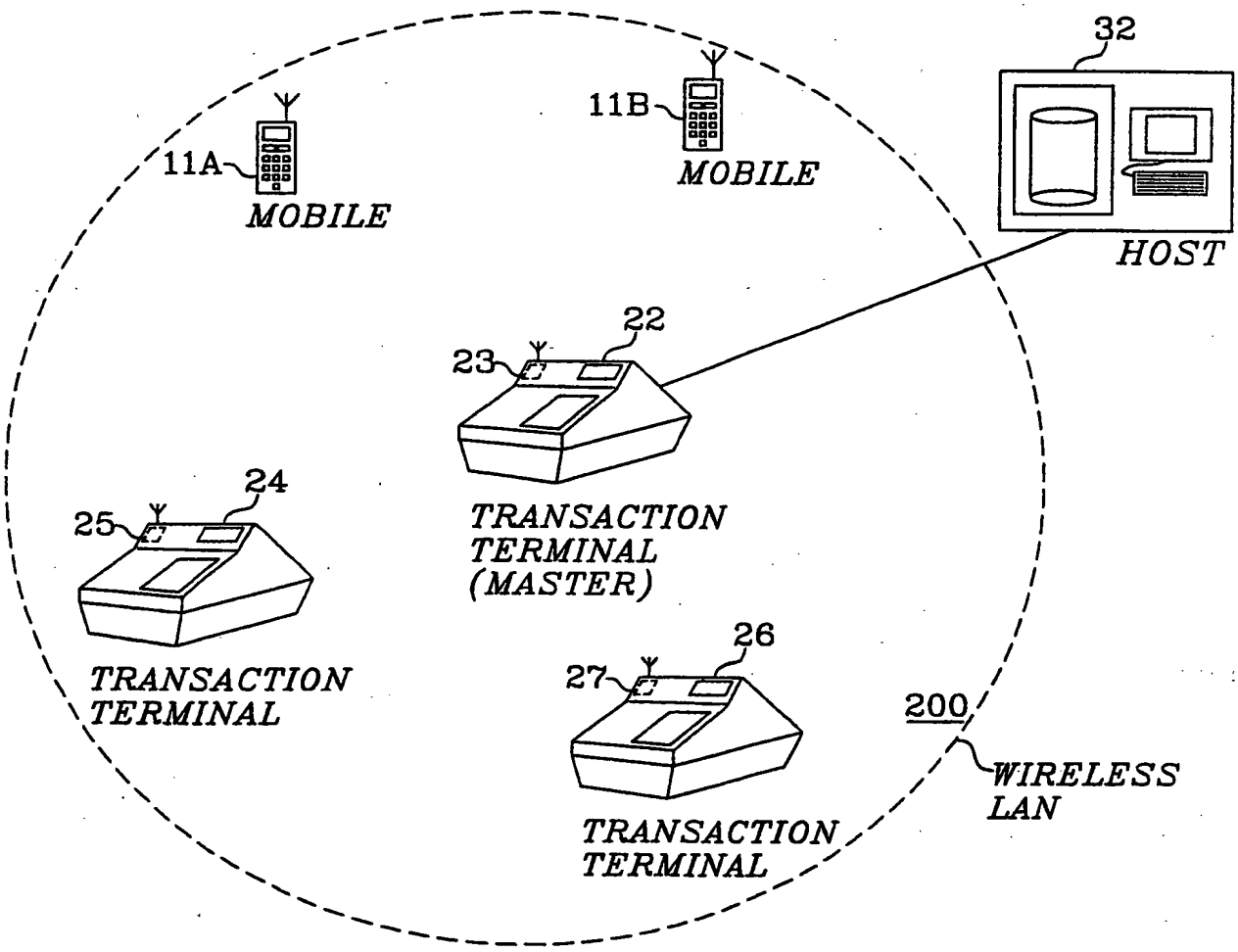
32
11B
11A
MOBILE
MOBILE
HOST
22
23
TRANSACTION
TERMINAL
(MASTER)
24
25
TRANSACTION
TERMINAL
26
27
200
WIRELESS
LAN
TRANSACTION
TERMINAL

Fig. 12

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 00/00085

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: H04L 12/28
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 9626505 A1 (COVELEY, MICHAEL), 29 August 1999 (29.08.99), see the whole document	1-3,5-11, 15-26,28-30, 34-37
Y	WO 9834203 A1 (JACOBS, PAUL ET AL), 6 August 1998 (06.08.98), see the whole document	1-3,5-11, 15-26,28-30, 34-37
A	US 5387784 A (JEAN-LOUIS SARRADIN), 7 February 1995 (07.02.95), see the whole document	1-36
A	US 5591949 A (ROBERT J. BERNSTEIN), 7 January 1997 (07.01.97), see the whole document	1-36

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" erlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
9 June 2000	28 -06- 2000
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer ROGER BOU FAISAL/EE Telephone No. +46 8 782 25 00

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

02/12/99

International application No.
PCT/SE 00/00085

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		ES 2131048 T	16/07/99
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